

CLAIMS

1. (amended) A thin plate manufacturing method of manufacturing a thin plate with a dipping mechanism dipping a surface layer part of a substrate (11) into a melt (7) of a substance including at least either a metallic material or a semiconductor material in a crucible (2) arranged in a main chamber (1) and unloading said substrate by solidifying said melt on the surface of said substrate,
5 loading said substrate into said main chamber through at least one loading subsidiary chamber (3) adjacent to said main chamber and unloading said substrate from said main chamber through at least one unloading subsidiary chamber (4) adjacent to said main chamber.
10
2. The thin plate manufacturing method according to claim 1, wherein switching means (23) is arranged between said main chamber and the subsidiary chamber, for loading said substrate into said main chamber and unloading said substrate from said main chamber along with switching of said switching means.
15
3. The thin plate manufacturing method according to claim 1, introducing inert gas into said main chamber while setting the pressure of the atmosphere of the main chamber to not more than the atmospheric pressure.
20
4. The thin plate manufacturing method according to claim 1, wherein said subsidiary chamber is constituted of a loading subsidiary chamber (3) and a unloading subsidiary chamber (4) for loading said substrate into the main chamber through said loading subsidiary chamber and unloading the substrate to which said thin plate (5) is bonded from the main chamber through said unloading subsidiary chamber.
25
5. The thin plate manufacturing method according to claim 2, wherein said subsidiary chamber is constituted of a loading subsidiary chamber and a unloading

subsidiary chamber, for synchronizing switching timings of the switching means for said loading subsidiary chamber and the switching means for the unloading subsidiary chamber with each other when opening and closing said loading subsidiary chamber and the unloading subsidiary chamber as well as said main chamber by switching said
5 switching means.

6. The thin plate manufacturing method according to claim 1, mounting said substrate on said dipping mechanism, bonding the thin plate (5) by opposing a thin plate growth surface of said substrate to the melt and thereafter directing the thin plate
10 growth surface to which said thin plate is bonded upward on a position other than a position immediately above said crucible for demounting the substrate from said dipping mechanism along with the thin plate in said main chamber.

7. The thin plate manufacturing method according to claim 1, cooling the substrate to which said thin plate is bonded on at least one position in said main chamber,
15 in said subsidiary chamber and outside the chambers.

8. The thin plate manufacturing method according to claim 1, stopping the operation of said dipping mechanism when the quantity of the melt in said crucible
20 decreases to a prescribed level for refilling a raw material into said crucible while not restarting the operation of said dipping mechanism until the temperature of the melt in the crucible and waving of the melt level thereafter stabilize.

9. The thin plate manufacturing method according to claim 8, loading said raw
25 material into the main chamber through a refilling subsidiary chamber (6) adjacent to said main chamber when refilling the raw material into said crucible.

10. The thin plate manufacturing method according to claim 1, simultaneously

introducing a plurality of said substrates into said subsidiary chamber from outside and loading the substrates one by one from said subsidiary chamber into said main chamber.

5 11. The thin plate manufacturing method according to claim 1, unloading the substrate to which said thin plate is bonded one by one from said main chamber into said subsidiary chamber and simultaneously discharging a plurality of substrates from said subsidiary chamber.

10 12. The thin plate manufacturing method according to claim 6, simultaneously introducing a plurality of said substrates into said subsidiary chamber from outside, simultaneously loading the plurality of substrates into said main chamber from said subsidiary chamber, further transferring the substrates to a mounting standby position (25) in said main chamber and shifting the substrates one by one from said mounting standby position to a mounting position on said dipping mechanism.

15 13. The thin plate manufacturing method according to claim 6, transferring the substrate one by one from a demounting position for demounting the substrate to which said thin plate is bonded from said dipping mechanism into an unloading standby position (26) in said main chamber and simultaneously unloading a plurality of substrates from said unloading standby position into said subsidiary chamber when said substrates accumulate by a prescribed number on said unloading standby position.

20 14. The thin plate manufacturing method according to claim 6, wherein said dipping mechanism performs demounting of the substrate to which the thin plate is bonded and mounting of a substrate to which a thin plate is newly bonded through the same operation.

25 15. The thin plate manufacturing method according to claim 6, equalizing, in a

series of operations of said dipping mechanism moving the substrate from a mounting/demounting position for mounting and demounting the substrate to a position for dipping the substrate into said melt, performing a dipping operation on said substrate for dipping said substrate and thereafter moving said substrate to the
5 mounting/demounting position for demounting said substrate, the direction of the horizontal operation of said substrate with an operational direction for moving the substrate to said mounting/demounting position when performing said dipping operation.

16. The thin plate manufacturing method according to claim 6, wherein said
10 dipping mechanism mounts a first substrate on a first position in said main chamber, moves onto said crucible for dipping said substrate into said crucible, thereafter moves for demounting said first substrate to which a thin plate is bonded on a second position different from said first position, mounts a second substrate to which a thin plate is newly bonded on said position, moves onto said crucible for dipping said substrate into
15 said crucible and thereafter moves to said first position for demounting said second substrate to which the thin plate is bonded on said position.

17. The thin plate manufacturing method according to claim 6, detecting the
position of a melt level in said crucible for controlling the operation of said dipping
20 mechanism for dipping said substrate into the crucible in response to the position of said melt level.

18. The thin plate manufacturing method according to claim 6, bonding the
thin plate to said substrate with a plurality of dipping mechanisms with respect to one
25 said crucible.

19. The thin plate manufacturing method according to claim 1, performing
temperature control of said substrate before mounting said substrate on said dipping

mechanism.

20. A thin plate manufacturing method of manufacturing a thin plate by dipping a surface layer part of a substrate (11) held by a dipping mechanism into a melt of a substance including at least either a metallic material or a semiconductor material in a crucible (2) arranged in a main chamber and solidifying said melt on the surface of said substrate, wherein

5 said dipping mechanism comprises first substrate transport means for transporting said substrate in a direction for dipping and unloading the substrate into and from said melt, second substrate transport means enabling transportation of said substrate in a second direction different from said first direction and substrate rotation means (75) capable of rotating said substrate by 360°, for dipping the surface layer part of said substrate into the melt in said crucible by controlling operations of said first and second substrate transport means and said substrate rotation means.

10

21. The thin plate manufacturing method according to claim 20, wherein said substrate rotation means rotates said substrate by applying actuating force with reference to a supporting point (76) of its rotation center on a power point (77) different from said supporting point and rotating said power point about said supporting point.

15

22. The thin plate manufacturing method according to claim 20, mounting said substrate on a substrate mounting member mounted to be rotatable about said supporting point and rotatable about said power point.

20

23. The thin plate manufacturing method according to claim 20, arranging a plurality of said power points with respect to one said supporting point.

25 24. The thin plate manufacturing method according to claim 20, wherein said

substrate rotation means rotates said substrate by applying actuating force to a shaft passing through its rotation center and rotating the shaft.

25. The thin plate manufacturing method according to claim 20, equalizing, in
5 a series of operations of said dipping mechanism moving from a mounting/demounting position for mounting and demounting the substrate to a position for dipping the substrate into said melt, performing a dipping operation on said substrate for dipping said substrate and thereafter moving to the mounting/demounting position for demounting said substrate, the direction of the horizontal operation of said substrate
10 with an operational direction for moving the substrate to said mounting/demounting position when performing said dipping operation.

26. The thin plate manufacturing method according to claim 20, wherein said dipping mechanism mounts a first substrate on a first position in said main chamber,
15 moves onto said crucible and dips said substrate in said crucible, thereafter moves, demounts said first substrate to which a thin plate is bonded on a second position different from said first position, mounts a second substrate to which a thin plate is newly bonded on said position, moves onto said crucible and dips said substrate into said crucible, thereafter moves to said first position and demounts said second substrate
20 to which the thin plate is bonded on said position.

27. The thin plate manufacturing method according to claim 20, detecting the position of a melt level in said crucible for controlling the operation of said dipping mechanism dipping said substrate into the crucible in response to the position of said melt level.
25

28. The thin plate manufacturing method according to claim 20, bonding the thin plate to said substrate with a plurality of dipping mechanisms with respect to one

said crucible.

29. The thin plate manufacturing method according to claim 20, performing temperature control of said substrate before mounting said substrate on said dipping mechanism.

30. A thin plate manufacturing method of manufacturing a thin plate by mounting a substrate on a dipping mechanism provided in a main chamber, dipping a surface layer part of said substrate into a melt in a crucible arranged in the main chamber and bonding a thin plate to the surface of said substrate,

manufacturing said thin plate by arranging a plurality of dipping mechanisms with respect to said crucible.

31. The thin plate manufacturing method according to claim 30, wherein a second dipping mechanism different from a first dipping mechanism performs at least one of operations of mounting said substrate, demounting the substrate to which said thin plate is bonded, temperature control of said substrate and movement of said substrate when the first dipping mechanism included in said plurality of dipping mechanisms performs a dipping operation.

32. The thin plate manufacturing method according to claim 30, performing temperature control of said substrate before mounting said substrate on said dipping mechanism.

33. (amended) A thin plate manufacturing apparatus for manufacturing a thin plate by mounting a substrate on a dipping mechanism provided in a main chamber, dipping a surface layer part of said substrate into a melt in a crucible arranged in the main chamber and bonding a thin plate to the surface of said substrate,

having at least one loading subsidiary chamber for introducing said substrate from outside said apparatus into said main chamber and having at least one unloading subsidiary chamber for unloading and discharging the substrate to which said thin plate is bonded from said main chamber.

5

34. (amended) The thin plate manufacturing apparatus according to claim 33, having switching means between said main chamber and said subsidiary chamber.

10 35. (amended) The thin plate manufacturing apparatus according to claim 33, wherein said loading subsidiary chamber and said unloading subsidiary chamber are provided on opposite positions through said main chamber.

15 36. The thin plate manufacturing apparatus according to claim 33, further having a refilling subsidiary chamber adjacent to the main chamber through switching means, for supplying a refilling raw material to the main chamber through said refilling subsidiary chamber.

20 37. The thin plate manufacturing apparatus according to claim 33, comprising substrate temperature control means on a front stage position of said substrate mounting position.

25 38. A thin plate manufacturing apparatus for manufacturing a thin plate by dipping a surface layer part of a substrate held by a dipping mechanism into a melt of a substance including at least either a metallic material or a semiconductor material in a crucible arranged in a main chamber and solidifying said melt on the surface of said substrate, wherein

said dipping mechanism comprises first substrate transport means for transporting said substrate in a direction for dipping and unloading the substrate into and from said melt,

5 second substrate transport means enabling transportation of said substrate in a second direction different from said first direction, and
substrate rotation means capable of rotating said substrate by 360°.

10 39. The thin plate manufacturing apparatus according to claim 38, wherein said substrate rotation means has a mechanism of rotating said substrate by applying actuating force with reference to a supporting point of its rotation center on a power point different from said supporting point and rotating said power point about said supporting point.

15 40. The thin plate manufacturing apparatus according to claim 39, comprising a substrate mounting member mounted to be rotatable about said supporting point and rotatable about said power point for mounting said substrate.

20 41. The thin plate manufacturing apparatus according to claim 39, wherein a plurality of said power points are arranged with respect to one said supporting point.

42. The thin plate manufacturing apparatus according to claim 38, wherein said substrate rotation means has a mechanism of rotating said substrate by applying actuating force to a shaft passing through its rotation center and rotating the shaft.

25 43. The thin plate manufacturing apparatus according to claim 38, comprising substrate temperature control means on a front stage position of said substrate mounting position.

44. A thin plate manufacturing apparatus for manufacturing a thin plate by mounting a substrate on a dipping mechanism provided in a main chamber, dipping a surface layer part of said substrate into a melt and bonding a thin plate to the surface of said substrate, wherein

5 a plurality of said dipping mechanisms are provided with respect to said crucible.

45. The thin plate manufacturing apparatus according to claim 44, comprising substrate temperature control means on a front stage position of said substrate mounting position.